## NORTH PACIFIC OCEAN, NOVEMBER 1936

By WILLIS E. HURD

*Atmospheric pressure.*—While the situation relative to the position of high- and low-pressure areas on the North Pacific Ocean during November 1936 was practically normal, the departures from normal barometer were unusually irregular, especially over northern waters. In the Aleutian region, where a strong cyclone persisted largely throughout the month, average pressures were 0.10 to 0.17 inch below the normal, while at Juneau the departure from normal was +0.18; and at Tatoosh Island, +0.31, which is an extraordinarily high value for that locality. The plus departure was also unusually high, +0.16 at Naha, in the Nansei Islands, Japan. (See table 1 for further pressure data.)

Anticyclonic conditions prevailed off the Pacific coast of the United States, and mostly, except for breaks due to passing cyclones, southwestward to Midway Island and on westward to the China coast.

The lowest corrected pressure of the month, 27.82 inches, was reported by the American steamship *President Jackson*, in 50°00′ N., 164°55′ W., on the 21st.

TABLE 1.—*Averages, departures, and extremes of atmospheric pressure at sea level, North Pacific Ocean, November 1936, at selected stations*

| Stations | Average pressure | Departure from normal | Highest | Date | Lowest | Date |
|---|---|---|---|---|---|---|
| | *Inches* | *Inch* | *Inches* | | *Inches* | |
| Point Barrow | 30.05 | +0.06 | 30.36 | 2 | 29.50 | 22 |
| Dutch Harbor | 29.42 | −.17 | 30.04 | 17 | 28.52 | 21 |
| St. Paul | 29.47 | −.12 | 30.12 | 13 | 28.64 | 1 |
| Kodiak | 29.46 | −.10 | 30.22 | 4, 26 | 28.66 | 22 |
| Juneau | 29.94 | +.18 | 30.48 | 24 | 29.06 | 17 |
| Tatoosh Island | 30.28 | +.31 | 30.58 | 30 | 29.92 | 16 |
| San Francisco | 30.14 | +.05 | 30.46 | 3 | 29.94 | 1 |
| Mazatlan | 29.90 | +.01 | 30.08 | 28 | 29.82 | 9 |
| Honolulu | 29.99 | −.03 | 30.19 | 18 | 29.69 | 23 |
| Midway Island | 30.16 | +.08 | 30.34 | 17, 18, 19 | 29.96 | 26 |
| Guam | 29.79 | −.07 | 29.90 | 29 | 29.66 | 18, 19 |
| Manila | 29.84 | +.01 | 29.94 | 23, 24 | 29.72 | 6 |
| Naha | 30.06 | +.16 | 30.18 | 24 | 29.92 | 1 |
| Chichishima | 29.98 | .00 | 30.20 | 25 | 29.32 | 21 |
| Urakawa | 30.07 | ---------- | 30.54 | 20 | 29.56 | 28 |

NOTE.—Data based on 1 daily observation only, except those for Juneau, Tatoosh Island, San Francisco, and Honolulu, which are based on 2 observations. Departures are computed from best available normals related to time of observation.

*Extratropical cyclones and gales.*—Stormy weather set in along the northern steamship routes during November, and on a number of days gales of great severity occurred, particularly along that part of the routes lying between longitudes 165° E. and 140° W. Within this region, to the northward of the fortieth degree of latitude, gales of force 11 to 12 were reported on the 4th, 10th, 16th, 18th, 19th, 20th, and 21st, and of force 10 on several other dates.

Few storms of consequence entered the ocean from Asia this month, and most of the cyclones merging in the well-developed Aleutian LOW were of oceanic origin. While most of these northern storms affected middle latitudes, yet few gales were reported in connection with them to the southward of the fortieth parallel, and such of the few as were noted by ships' observers did not exceed 8 in force.

In upper east longitudes most of the severe weather occurred before the 20th, with the highest winds, force 11, reported by the Danish motorship *Nordpol* on the 4th; by the Japanese steamship *Biyo Maru* on the 10th; and by the American steamship *President Jackson* on the 19th, all near 48° N., 172°–175° E.

In west longitudes the heaviest gales occurred within the period 16–21st, with few high winds in excess of force 8 or 9 preceding the 16th, and none in excess of force 8 reported following the 22d. On two of these dates winds of force 11 were encountered, first, by the Norwegian motorship *Somerville*, on the 16th, in 41°24′ N., 146°48′ W., and second, by the Japanese steamship *Biyo Maru*, on the 18th, in 50°20′ N., 149°45′ W. On the 20th and 21st the eastbound steamship *President Jackson*, which had already weathered the severe gale of the 19th south of the western Aleutians, became involved in the heavier winds of the deepest cyclone of the month centered southeast of the eastern Aleutians. The ship on the 20th proceeded into the teeth of an easterly hurricane, and approximately 24 hours later was in a westerly gale of similar force, lowest barometer 27.82 inches.

Subsequently to the 22d the roughness of the weather subsided generally over the North Pacific, and on only two dates thereafter, the 24th and the 30th, were isolated gales of as high force as 10 met with in northern waters.

The west coast of the United States and Canada, largely dominated by anticyclonic conditions in November, was singularly free of high winds, according to ships' observations. Only one vessel encountered gales within a day's journey of the American extratropical coast. This was the British steamship *Empress of Japan*, which, after leaving Victoria, British Columbia, on a voyage toward Honolulu, met a south gale of force 8 on the 15th, and a southwesterly whole gale on the 17th, the latter occurring in 42°48′ N., 134°42′ W.

*Tropical gales and cyclones.*—In the American Tropics, northers of force 7 occurred on the 23d; of force 8 on the 27th and 28th; and of force 9 on the 5th, in the Gulf of Tehuantepec.

On November 18 strong northeast trades (force 7) were reported east of the Hawaiian Islands and in low latitudes northwest of Palmyra Island.

On the 9th and 10th of the month a tropical cyclone raged over the Marshall Islands. Jaluit, the port of entry for Nauru Island, near 6° N., 170° E., reported a south gale of force 9, barometer 29.66, at p. m. observation of the 9th. On the morning of the 11th the wind had risen to force 11, with barometer at 29.56. At p. m. of the 11th the wind had shifted to southwest, force 9, with rising pressure. No further details of the storm are available.

Subjoined is a report by the Reverend Bernard F. Doucette, of the Weather Bureau, Manila, P. I., descriptive of three typhoons and one depression which occurred on the southwestern Pacific during Novmber 1936. These, it is to be noted, do not include the typhoon of the Marshall Islands, mentioned in the preceding paragraph.

In connection with the typhoon of November 18–23, described by Father Doucette, the following additional data are derived from our ships' reports. On the 22d the American steamship *Liberator*, on the west side of the storm center in 31°52′ N., 142°40′ E., experienced a whole gale from the north, lowest barometer 29.34. The American steamship *Michigan*, Masbate, P. I., toward San Francisco, rode across the north quadrants of the storm on the 20th and 21st, encountering gales of force 8–10 from northeast to east. The wind changed to southeast on the morning of the 22d, then to south with an increase to force 11 about 6 p. m., lowest barometer 29.17, in 29°30′ N., 146°15′ E. Two hours later the ship was in a southwesterly hurricane, which lasted until midnight. Thereafter, with rapidly rising barometer, the wind abated. The typhoon then passed northward to the eastward of

Honshu and Hokushu Islands with great speed and lessened severity, and by the 24th had joined with a depression over the Sea of Okhotsk.

*Fog.*—There was little fog recorded on the open reaches of the Pacific this month, reports showing that it occurred only on the 1st and 9th, in upper east longitudes. In coastal waters of California there were 9 days with fog and in those of Washington, 8 days. Press reports from Vancouver state that shipping, owing to dense fog, was tied up at the water front from the 25th to 27th. Fog formed on the 9th near the Gulf of Tehuantepec.

## TYPHOONS AND DEPRESSIONS OVER THE FAR EAST NOVEMBER 1936

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There were three typhoons and one depression over the ocean regions east of the Philippines during November 1936. In addition, during November 10 to 12, a mild depression formed over the eastern Caroline Islands, moved west-northwest, threatened to develop, but finally disappeared, apparently of minor importance.

*Typhoon, November 1 to 8.*—A depression moved from the eastern Caroline Islands westward to longitude 135° (Nov. 4), and then inclined to the northwest, intensifying at the same time. On November 6 it was central in latitude 13°30′ N., longitude 127°30′ E., strong enough to be classified as a typhoon, from which position it moved westward and entered the Philippines south of Virac, Cataduanes Islands, and Legaspi, Albay Province (Nov. 6 and 7). When it was close to the archipelago, it was found to be a small typhoon of moderate intensity, decreasing in strength as it passed over the northern Visayan Islands. It passed over the Verde Island Passage into the China Sea, where it disappeared on November 8.

The November 6, 4 p. m. observation at Atimonan, Tayabas Province, was north-northwest wind force 7 with barometer 752.8 mm (29.638 inches). At the same time, Odiongan, Romblon Province, reported southwest winds, force 5, and a pressure of 753.7 mm (29.673 inches). The estimated pressure at the center of the disturbance was about 750 mm (29.528 inches).

*Typhoon, November 5 to 12.*—On November 2, the steamship *Thistlebrae* encountered a small center near latitude 14° N., longitude 155° E., with winds of hurricane force veering from northeast (Nov. 2, 8 a. m.) to south (Nov. 3, midnight), the minimum barometer being 735.4 mm (28.953 inches). After November 2 no reports were received from the neighborhood and the typhoon appearing in the regions represented by the weather map, November 5, is probably the same center reported by the steamship *Thistlebrae.* On this day, about 300 miles northeast of Guam, there was a definite center and apparently a typhoon, as far as the observations received from Guam and Saipan could indicate. It moved westward, November 5 to 8, then recurved to the northeast, moving from latitude 17°30′ to 24° N., between the meridians 134° and 130° E. It inclined to the north-northeast on November 11 and passed beyond the region of observation, November 12. On November 11, the afternoon observation reported from the Bonin Islands was south-southwest winds, force 4, barometer 754.5 mm (29.705 inches).

*Typhoon, November 18 to 23.*—A depression formed over the eastern Caroline Islands and finally moved westward, intensified, and appeared as a typhoon about 250 miles south-southeast of Guam. Here it abruptly changed its course to the north, inclined slightly to the north-northwest as it passed about 50 miles east of Guam, moving quite rapidly. It then proceeded along a west-northwest course for one day (Nov. 20) and recurved to the north-northeast the afternoon of November 21. The next morning, it was central about 180 miles west-southwest of the Bonins. Its motion along a northeasterly course brought it beyond the region of observation on the afternoon of November 23.

Along the course of this typhoon, the observations which can be used to judge its intensity are as follows: The lowest barometer reading at Guam was 748.5 mm (29.468 inches) with south winds, force 4, 3 p. m. November 19. On November 22, 6 a. m. the Bonin Islands had a pressure of 746.0 mm (29.370 inches) with winds of force 8 from the south-southeast. At 2 p. m. of the same day, 743.0 mm (29.252 inches) with southwest winds of force 8 were reported from the same location. The typhoon apparently weakened November 21 and then quickly intensified the next day.

*Depression, November 25 to 30.*—A mild depression formed east of Mindanao, moved west-northwest to the Visayan Islands, where it changed its course to the southwest for a short time, bringing the center to the Sulu Sea. From here it proceeded across the northern part of Palawan Island to the China Sea where it disappeared.